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ABSTRACT

Rapid technological change has created a great need for continuing education programs for those engineers not participating in advanced degree programs. The Engineers' Council for Professional Development (ECPD) believes an additional system is needed to enable the engineer, employer, and educator to measure and maintain continuing education efforts. To meet ECPD suggested course evaluation criteria, the content, extent, instructional competence, student performance, and sponsorship must be maintained at third year college level or better and still be flexible enough to motivate participants. Achievement Certificates will be awarded upon accumulation of 20 units of study, each unit representing 40 to 45 hours of work. University credits would be transferred on the basis of one semester credit hour per unit. Specifics regarding the maintenance of an adequate record keeping system, data needed, and budgetary information are presented. As final recommendations toward establishing a continuing education program meeting ECPD standards, computerizing records, hiring a consultant in continuing education studies, and a full time administrative secretary are suggested. (MW)

ED 089143

report of the Committee on Recognition of Continuing Engineering Studies

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A. Introduction

The need for constant self-renewal is of extreme concern in the engineering profession. While the fruits of the engineer's efforts have advanced the material well-being of society, the concurrent rapid technological change has tended to reduce the effectiveness of these same engineers. Also, there is increased need for engineers in the solution of broad socio-technical problems for which the engineer's education should be broadened. As the engineer's experience becomes longer, these additional educational needs become stronger. Because of their concern over this problem, the Engineers' Council for Professional Development, the American Society for Engineering Education, the Engineers Joint Council and the National Society of Professional Engineers appointed the Joint Advisory Committee on Continuing Engineering Studies to catalog, clarify and evaluate alternate methods by which the many segments of engineering could update their needed technical competence and to be effectively informed on new technology and social needs.

Analysis of the 1966 Report of the Joint Advisory Committee and our own experience indicates that the focus of our problem is to improve the technical base and the interpersonal and administrative capabilities of engineers during their mid-career years. In greatest need are those men who cannot or will not participate in the advanced degree, on-campus programs of colleges or universities. A new approach is needed to stimulate their participation in courses aimed at improving their technical and non-technical capability and understanding and thereby improve their effectiveness as employees and their satisfaction as professionals. Such courses are widely available through professional societies, trade associations, government and companies employing engineers as well as through engineering colleges or universities.

The Engineers' Council for Professional Development (ECPD) believes that in addition to the academic degree system of education, a well-organized recognition system is also needed to enable:

(1) The engineer to demonstrate and measure his continued efforts for maintenance of professional and managerial competence and for further training in preparation for greater future responsibilities,

(2) the engineer and his employer to better evaluate the relative merits of different available courses or educational programs,

(3) new employers to assess the value of continuing engineering studies by job applicants, and

(4) the continuing engineering education faculties to facilitate their planning of courses and educational programs for engineers.

The heterogeneous character of continuing education programs now available will become better coordinated with much greater benefits to engineers due to improved motivation of the individual engineer, and will result in the general improvement of the performance of engineering personnel.

ECPD believes that it should seek to stimulate individual engineers to participate in continuing engineering studies by certifying the completion of registered courses which are directed toward the career objectives of an individual whether largely technical, managerial, social-cultural or mixed.

ECPD proposes to develop a recognition procedure with the above objectives and to implement it experimentally for a period of three years after which it will become largely self-sustaining. This procedure shall possess the following salient features.

(1) A mechanism to evaluate and record continuing engineering studies courses in accordance with criteria prepared by ECPD (See Section C).

(2) A system of accumulation of credit and the evaluation of the composite for recognition by awarding national Achievement Certificates (See Section D).

CE 001 578

The above features would encourage increased study because the courses would have been evaluated and recorded by ECPD, thereby assuring the engineering public of a recognized level of educational achievement. A particular advantage is that students would not be restricted to a single location or academic institution to achieve an integrated and worthwhile program. Students would be further motivated to complete an integrated educational program by the award of the proposed national Achievement Certificate.

B. Scope

Based upon Engineers Joint Council data, it is estimated that no less than 1,000 engineering and engineering-related continuing education courses are being offered each year by institutions of higher learning throughout the United States. Enrolled in these courses are approximately 15,000 persons. Reliable information on courses sponsored by professional societies, trade associations, industrial concerns and governmental agencies is lacking at the present time. However, it is estimated that the total continuing education studies student population in 1967 is at least twice this amount, more than 30,000 engineers. It is further estimated that these individuals are registered in no less than 2,000 individual courses. If continuing engineering education study expands in the future as it has in recent years this population is certainly going to increase to the point where we estimate that it will include approximately 80,000 continuing engineering studies students enrolled in approximately 6,000 different courses.

It is our belief that although the initial participation in this recognition program might be as low as 10% of the students and courses involved, it will reach a level of 75% participation which is approximately the same level which we are now experiencing in the undergraduate accreditation program also sponsored by ECPD.

C. Suggested Course Evaluation Criteria

In order to achieve a meaningful evaluation procedure, acceptable criteria must be established. To achieve maximum flexibility and minimum administrative effort while accomplishing the desired benefits, requirements such as the following must be adopted:

Any course or courses to be identified for recognition either singularly or in groups should meet the following criteria:

(1) *Content*

The subject matter must be outlined and the required prerequisites defined and maintained.

(a) Courses appropriate for advancing the total education of a graduate engineer will be considered acceptable.

(b) Normally courses must be at a level equivalent to those presently taught in the third year of college or higher.

(c) Subjects, where the state of the art has developed so rapidly that they were not offered when the participant was in college, can be approved even though they are now a part of college programs at the freshman or sophomore level. Computer logic and programming represents a typical example of such courses.

(2) *Extent*

The course must be appropriately named and offered on a scheduled basis. It should be listed as a catalog course accepted for a degree or it should require a minimum of full-time involvement by the student for one week or the equivalent of one semester hour of university credit.

(3) *Instructional Competence*

The instructor must be qualified to teach at a level appropriate for the subject and the stated objective of the course.

(4) *Student Performance*

Student performance in the course should be evaluated by meaningful measures such as examination, oral or written presentation, or homework. Attendance at lectures with no additional work or examinations will not be considered an acceptable course program worthy of ECPD recognition.

(5) *Sponsorship*

Sponsorship should be offered by an organization identified by ECPD as capable of offering acceptable individual courses or programs of courses in Continuing Education. Initially such organizations would be one of the following: —

(a) Educational institutions accredited by a regional association to offer courses of college grade.

(b) Sections or other organized subdivisions of member societies in ECPD and EJC.

(c) Government and industrial organizations offering organized courses primarily intended for engineers with at least a bachelor's degree.

Although the material listed above may seem lengthy and detailed, it is the intention of ECPD that these be administered in a flexible and reasonable manner so that the participant will be motivated to advance his capabilities through continuing engineering studies and that the course-giving institutions will not be excessively burdened by administrative procedures, all the time maintaining an acceptable threshold of technical, managerial or social-cultural quality.

D. Tentative Criteria for Award of Achievement Certificate

(1) ECPD Achievement Certificates will be awarded upon the accumulation of a minimum of 20 units of study together with the submission of a short essay outlining the plan of the student in his pursuit of continuing education, and the way in which he considers the 20 units to fit into his plan.

(2) Additional certificates will be granted for each additional 20 units of study recognized by ECPD. An essay will be required for each additional certificate.

(3) One unit of study shall be offered for a course requiring a total effort estimated at 40–45 hours of average student time including class and laboratory attendance and preparation. A greater number of units will be allocated proportionately for more extended courses.

(4) Catalog courses acceptable for university credit are also acceptable without ECPD registration on the basis of one semester credit hour per unit at accredited institutions as identified under C. 5 a.

Organizations that wish to offer ECPD recognized courses should apply for evaluation of all individual courses for which recognized units are to be issued. Before offering the first such recognized course, and bi-annually thereafter, they shall submit to ECPD information necessary for the evaluation of the courses and their organization.

E. System

When evaluation and recording of courses is requested, the following information on organizations shall be submitted:

(1) For educational institutions, the status of their accreditation by a regional association.
(2) Where needed for other organizations, additional information may be required as follows:
  (a) the program of education they proposed to offer,
  (b) the organization of their educational program, including educational background and the experience of administrative personnel involved,
  (c) the financial resources and physical facilities available for the program or course of instruction.

For the first and all succeeding courses, the following data must be submitted on each course to be evaluated and recorded:

(1) The name of the course.
(2) An outline of the course content.
(3) The prerequisites required.
(4) The calendar schedule.
(5) The number of contact hours, the expected hours of preparation required and the proposed credits to be offered.
(6) The name and qualifications of the instructor.
(7) The history of the course, if previously offered.
(8) The system of examinations or other evaluation of student performance.
(9) The method of student selection.

Course certificates will be issued in triplicate. The original and one copy will be given directly to the student by the organization conducting a course. The third copy will be sent to ECPD headquarters. They will be issued upon completion of the course in a satisfactory manner as determined by the approved assessment procedure. The course certificate will list the student's name, the name of the course, the approved number of units granted, the name of the institution conducting the course and the signature of an appropriate representative of the institution.

When a student has collected at least 20 units of relevant study, he shall send one of his certified copies for each course together with his essay to ECPD headquarters. The essay shall be read to determine whether the student has given proper consideration to an integrated program of continuing education in selecting his courses. Where the ECPD reader considers that the selection has been too random or opportunistic, additional units beyond the 20 submitted may be required before a certificate is issued. A time limit will be established beyond which credits will become obsolete.

ECPD will establish a committee for the direction and control of the Continuing Education Recognition program with representation from each of the ECPD member societies. Under the leadership of this Committee, additional personnel shall be identified to provide readers to evaluate the essays and the award of individual certificates. Visitations to institutions will be arranged by ECPD by qualified educational inspectors whenever correspondence proves inadequate for evaluating programs or courses.

When the representative of the regional committee has approved the essay he shall notify ECPD headquarters which shall then issue the certificate to the student and make a record for its files. The essay shall be sent to headquarters and filed with other records of the student.

F. Budget

It is considered necessary to develop competent staff to administer policy and carry out all routine administrative activities efficiently. Limited use of consultants and programmers will be necessary during the initiation period. Development of policy, planning of evaluation procedures, acceptance of courses and programs for the approved ECPD list, and award of certificates will be by committee action at least until procedures are fully standardized. All committee service, regional chairmen's effort and inspections or reviews of student programs and essays will be by volunteer service from professional engineers and faculty members. Only necessary travel expense will be paid by ECPD. This system has been proved by thirty years of ECPD experience. Based upon this experience a total grant of $159,000 over a three-year period appears necessary to initiate the program, after which financial responsibility would be assumed fully by ECPD to be covered largely by course evaluation fees and certificate fees.

G. Recommendations

It is expected that approximately 500 courses will be processed during the first two years and approximately 1,000 courses by the completion of the third year.

It is recommended that the services of a competent and experienced individual in the area of continuing education studies be employed as a consultant for a period of one to two years to help organize the proposed activity and to get it running at top efficiency as quickly as possible. It is further recommended that record keeping be computerized to the greatest extent possible and the services of a programmer-consultant be obtained to establish a program which will be useful on a routine basis by the secretarial staff during future years. This action is essential to minimize future clerical costs and time delays in handling increasing peak loads.

It is further recommended that a full-time administrative secretary be employed who will have the responsibility of administering and developing the program under the general supervision of the Executive Secretary of ECPD. During the third year of experimentation, the Continuing Engineering Studies Committee and the administrative secretary shall have the responsibility of developing a firm basis for continuing this program on essentially a self-sustaining basis or to recommend its discontinuance.

It is the firm belief of this Committee that the advantages enumerated earlier in this report will make this an attractive and desirable program and that our major problem will not be the maintenance of support but the maintenance of adequate quality during its rapid growth.